

# **Progress Report: Improving Quantitative Information for the California Water Plan**

June 5<sup>th</sup>, 2007

The new analytical approach the California Department of Water Resources (DWR) is pursuing to identify and quantify water management conditions is described in Chapter 4, Volume 1 of Update 2005. This approach was developed after extensive discussion with the Update 2005 Advisory Committee. The need for the new approach is highlighted in Recommendation 11 of Update 2005:

“DWR and other State agencies must improve data, analytical tools, and information management and exchange needed to prepare, evaluate, and implement regional integrated resource plans and programs in cooperation with federal, tribal, local, and research entities”

To address uncertainty in future water management conditions, California needs better data and analytical tools to produce useful and more integrated information on water quality, environmental objectives, economic performance, social equity objectives, and surface water and groundwater interaction. Today, it is difficult to compare, much less integrate, water data and information from different local entities to understand and resolve regional and statewide water management issues. To make significant progress toward a more comprehensive scientific understanding, California needs to create a new information exchange and management system and more integrated analytical tools that can be used to document and share knowledge as it is developed.

## **Objectives for Water Plan Quantitative Analysis**

DWR and the Update 2005 Advisory Committee developed a new planning framework that identifies broad objectives for the California Water Plan including disclosure of all technical assumptions. DWR held several workshops with land use and resource planners, academics, policy analysts, and technical experts to build on and affirm advisory committee understanding about critical issues that the Water Plan should address. These conversations have been captured in a “mind map” (See Attachment 1) that represents a web of relationships and ideas. The discussions identified a desire to address crosscutting issues such as environmental objectives, land-use planning, and economics in different scenarios. Quantifying these issues requires significantly more technical and quantitative information than was used in previous Water Plan Updates. An alternative representation of the Mind Map is shown in Attachment 2, which lists questions that should be answered quantitatively by the Water Plan.

## Quantitative Deliverables

Update 2005 describes three groups of quantitative deliverables (See Box 1) that are becoming the technical foundation the California Water Plan. Due to resource and schedule constraints, Update 2005 did not fully implement the future scenarios or include alternative response packages. However, these new concepts help define the long-term direction for improving the analytical approach for the California Water Plan.

Box 1  
Quantitative Deliverables  
for the California Water Plan

- **Water Portfolios** – describe where water originates, where it flows, and what it is used for based on recent data.
- **Future Baseline Scenarios** – explore potential conditions that could exist in the future related to expected changes likely to occur without a change in management action.
- **Alternative Management Responses** – describe packages of promising management actions, predict expected outcomes within the water management system, and compare performance of the different packages under each future scenario.

## Implementation

DWR has identified three broad activities that must be initiated and conducted simultaneously to improve analytical capabilities in support of the Water Plan. The context and next steps for implementing the three activities described below are the focus of this proposal. Implementing a response requires significant participation by many entities that either generate information used by the Water Plan or use information in the Water Plan to make decisions. The critical activities are:

- Promoting Collaboration
- Facilitating Information Exchange
- Improving Numbers for the California Water Plan

### ***Promoting Collaboration***

There are many reasons to promote collaboration. Integrated resource planning requires multi-disciplinary information, and no single entity has the expertise or other resources required to develop all of the analytical tools and data needed to answer these broad questions. Furthermore, people want to improve the shared understanding and access to useful information across the state at an appropriate resolution. This desire to report information at various resolutions around the state requires that local and regional entities be able to interact and share data in some commensurate way.

DWR has initiated several activities as described below to promote collaboration on the Water Plan. This includes forming the Statewide Water Analysis Network to serve as the technical advisory group for the Water Plan, employing the Shared Vision Planning approach to foster open communication, and partnering with experts outside of DWR on near-term studies.

#### Statewide Water Analysis Network

At the end of Update 2005 DWR initiated the Statewide Water Analysis Network (SWAN) to engage interested parties throughout the state to leverage available resources and improve the shared quantitative capability involving California's water management system. SWAN is a voluntary effort that will serve as the primary technical advisory group for the Water Plan and related statewide water planning efforts. SWAN includes representatives from local, state, and federal agencies, universities, non governmental organizations, and technical consultants. The need for a group like SWAN is highlighted in the September 2005 report prepared by the California Water and Environmental Modeling Forum (CWEMF) entitled, "*Strategic Analysis Framework for Managing Water in California*", (<http://cwemf.org>). The CWEMF report presents a wide array of possible institutional arrangements that could improve the institutional setting for developing and applying qualitative capability over the long-term.

#### Shared Vision Planning

DWR has researched techniques for collaboratively improving analytical tools and believes the Shared Vision Planning method employed by the U.S. Army Corps of Engineers, Institute of Water Resources may be suitable for the Water Plan. In particular, the Shared Vision Planning matches the desire of the Water Plan Advisory Committee to provide water resources planning information in an open and accessible way. Other benefits of Shared Vision Planning include:

- Can be applied to any water resource problem where stakeholders are willing to come to the table
- Allows stakeholders to identify what can be done and what ought to be done
- Focuses on facts and data relationships first, then values and tradeoffs
- Provides a method to structure and facilitate the debate
- Integrates policy, collaboration, and technical analysis

#### Partnering on Near-Term Studies

For preparing *California Water Plan Update 2005*, DWR established some mutually beneficial partnerships with entities engaged in research or studies of interest to the Water Plan. DWR will continue to form these partnerships for the next Water Plan Update as a way of infusing new ideas and to maximize the benefit of outside expertise and funding.

#### ***Facilitating Information Exchange***

In the Update 2005, DWR committed to begin implementing "... the Water Plan Information Exchange (Water PIE) for collecting and sharing data, and networking existing databases and websites, using GIS software to improve analytical capabilities

and developing timely surveys of statewide land use, water use, and estimates of future implementation of resource management strategies”. Implementing Water PIE requires both short-term and long-term phases. The short-term phase will likely include showing linkages and providing easy access to information used by the California Water Plan to assess current and future water management conditions. This will help to promote transparency and build confidence among stakeholders that related statewide planning efforts are being sufficiently coordinated. The goal of the long-term phase is to develop an interactive data management system to promote integrated regional water planning. Water PIE will require protocols for managing data including a common definition of terms and data quality control.

### Urban Water Management Plans

One area DWR is actively pursuing to facilitate information exchange is with Urban Water Management Plans. State law requires urban water purveyors with over 3000 connections to develop and submit Urban Water Management Plans every 5 years to DWR. The Update 2005 Advisory Committee strongly encouraged DWR to directly integrate Urban Water Management Plans with the California Water Plan. In January of 2007 DWR held a SWAN workshop to discuss this in more detail. As a result, DWR has been meeting with a sub group of SWAN over the last several months to develop a detailed scope of work for a pilot scale study. This pilot study will be implemented as funds become available.

### ***Improving Numbers for the California Water Plan***

The CWP Update 2005 outlines three sets of quantitative deliverables, as described earlier:

- Water Portfolios
- Future Scenarios
- Alternative Response Packages

A significant barrier to reaching agreement about specific computational methods is an insufficiently developed shared understanding of how the California water management system works, and how it responds to changes. When there is a technical disagreement about a model or parts of a model, we rarely have a productive discussion that leads resolution. Discussions tend to be vague. The only approach effectively applied to resolve technical disputes has been to pay experts to conduct a scientific review. This is both expensive and slow. It would be much better to have a process for simultaneously improving the conceptual understanding of California’s water management system and its representation in the analytical tools we use. To achieve this end the CWP team has committed to:

- Take a fresh look at our collective understanding of how the water management system works
- Interact with experts to make sure we capture the latest thinking
- Document our collective understanding of the water management system in an archival manner that can evolve over time

## Developing a Conceptual Understanding of the Water Management System

These ideas were presented and discussed in a meeting with the Analytical Tools and Data Workgroup on June 3, 2005. During the meeting, DWR proposed to apply a standard analysis and design approach used widely in the software development industry, called the Unified Process. The Unified Process is an iterative approach based on object-oriented thinking that allows a team to identify and describe the relevant aspects of the real world that should be represented in an analytical tool to fulfill a particular purpose. Through the Unified Process, a number of artifacts can be developed collaboratively to document the requirements of the quantitative analysis system, and a shared understanding of the water management system. The artifacts can be developed using the Unified Modeling Language (UML), which is a visual notation language that provides a standard notation to describe a system in terms of objects, relationships, interactions, sequence diagrams, and state changes.

During a December 2006 SWAN workshop DWR presented the results of a pilot project that applied the Unified Process to describe how urban water use is currently determined for the Water Plan. Staff presented a series of diagrams developed with standard UML notation, each describing a different level of detail. The workshop concluded with an interactive exercise to apply the Unified Process technique. The next step for this work is to identify different components of the water management system and collaborate through SWAN to develop a common conceptual understanding of the water management system. This conceptual understanding will form the basis of improvements to analytical tools used by the Water Plan.

## **Current, Near Term, and Long Term Activities**

DWR has identified several activities to improve analytical tools and data to support statewide and regional water planning. These activities, described below, are categorized by *Current Activities* that are underway and will be largely complete when Update 2009 is published, *Near Term Activities* that will be developed during Update 2009, and *Long Term Activities* that will not be significantly completed for Update 2009. The ability to implement these activities is severely limited by resources. At this time funding does not exist to implement all activities described below.

### ***Current Activities***

- DWR is working with the Rand Corporation to evaluate uncertainty in water management using the technique of Robust Decision Making.
- DWR is working with the Stockholm Environment Institute and the National Center for Atmospheric Research to evaluate the effects of climate change on water management in the Sacramento Valley using the Water Evaluation and Planning System model, WEAP.

- DWR's Water Plan and CALSIM III development staff are working to improve communication between DWR's data collection activities and its analytical capabilities.
- DWR's Planning and Local Assistance Division has developed a draft strategy for integrating data internally and for sharing its data with the public.
- DWR is working through SWAN to develop a scope of work to integrate data from Urban Water Management Plans regionally and with the Water Plan

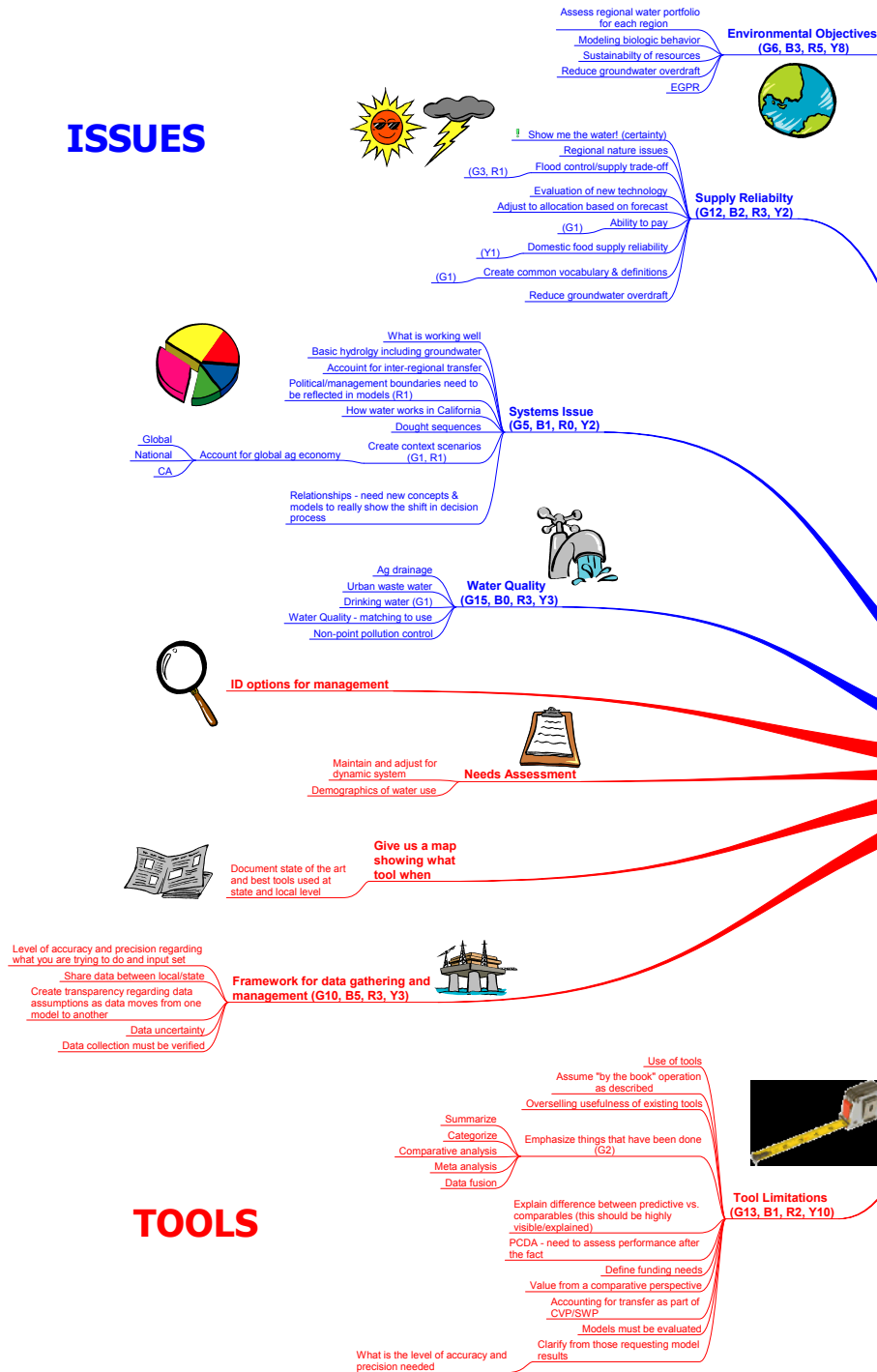
### ***Near Term Activities***

- DWR will develop a draft short-term plan for specific quantitative deliverables for Update 2009 and a draft long-term plan for improving analysis for the Water Plan.
- DWR will work with SWAN to develop a final short-term and long-term plan for quantitative deliverables.
- DWR will conduct a series of Shared Vision Planning workshops to assist with collaboratively developing objectives for Water Plan analysis.

### ***Long Term Activities***

- DWR will work through SWAN to identify areas of key research to improve analytical tools and data form statewide and regional water planning. DWR will seek out entities engaged in key research and invite them to collaborate on mutually beneficial projects. DWR will pursue those projects where each side is willing and able to dedicate the required resources to implement the project.
- DWR will work through SWAN to develop a strategy to exchange information with other entities. Keys tasks for information exchange include developing a common glossary of terms, water budget components, and guidelines for data collection, compilation, and management.
- DWR will develop a web portal to link to or publish data used by the California Water Plan.
- DWR will work through SWAN to create a "high-level" conceptual design that describes urban water demand. This conceptual design will identify the components of the water management system necessary to compute urban water demand under various conditions. Examples of these components include demand forecasting, supply forecasting, and technology adoption. These component descriptions will be created and refined over time.
- DWR will work through SWAN to effectively integrate data produced for Urban Water Management plans with the Water Plan.

## ISSUES



## TOOLS

**STATE WATER PLAN**  
**Critical Issues to Address**  
**With Regard to Analytical Tools**  
**GOVERNANCE**  
**State Strategic Directions**

## Equity Objectives (G3, B1, R0, Y1)

EGPR

## Economic Objectives (G0, B2, R1, Y0)

Lack of supply reliability  
EGPR

## Economics Cost Pricing

Consider beneficiary pay issue

## POLICY &amp; USERS

## How does regional and state plan intersect (G1, B0, R3, Y1)

Consistency and understanding of how it relates

Local gap - need info - can Water Plan do it?

Clarify how regions can use the plan

Be clear about intended use

Bottom up planning (R1)

Correctly accounting for drought water bank (following)

## Land Use Decisions &amp; water impacts (G1, B1, R3, Y2)

## Not just for Water People (G3, B0, R1, Y0)

Understandable language

Who fills the gap?

Timing of info vs. precision

Applicability

## Decision Making Framework and Process

Check model results after project

Appropriate scale

More policy relevant

## Water Law and Regulations (G4, B0, R6, Y11)

Need absolute assessments (see show me the water)

Encourage local and regional planning

TMDL

Non-point pollution control

Public vs. private

## Transparency - put it on the web (G2, B2, R0, Y0)

## Show trades between alternatives (G5, B1, R6, Y1)

Evaluating benefits impacts of different w. man options

What investments State needs to make

Impact of water conservation

Compare advantages

## Quality

Needs Assessment

Guidance

Useful?

Right?

Enter Sub-topic

<b>Questions that should be answered quantitatively by the Water Plan</b>	
1	What are the most pressing local, regional, and statewide water management problems now and in the future and what are potential solutions to the problems?
2	What are estimates of the local, regional, and statewide components of the hydrologic cycle in California?
3	What are the current water management strategies and uses, what are potential future strategies and uses, and how are these estimated for all sectors (agricultural/environment/urban) and all levels (local, regional, statewide)?
4	How does water quality affect water management in California and vice versa?
5	How does land use affect water management in California?
6	How can the sustainable use of water resources be improved?
7	How should water be managed in California to help prepare for catastrophic events?
8	How will climate change affect water management in the future?
9	How should California manage flood events and flood plains?
10	How do water management strategies and policies affect hydropower production?
11	How do water management strategies and policies affect environmental resources?
12	What is the effectiveness of water management strategies?
13	How are social equity issues affected by different water management strategies?
14	How can California identify and fulfill its public trust responsibilities?
15	What are some of the benefits of and trade offs between different water management strategies?
16	How much do local agencies, the regions, and the State invest in each water management strategy currently and how much can/should they in the future?
17	What is the remaining useful life and what are the unmet maintenance needs of existing storage and conveyance facilities?
18	Who should pay for improvements in local, regional, and statewide water management?
19	How do different water management strategies and policies affect crop production?
20	How does water scarcity affect the economy, the environment and all beneficial uses?
21	How should local agencies, the regions, and the state manage water during multiple year droughts?
22	To what extent can local, regional, and statewide water management strategies provide adequate and reliable water of suitable quality for all beneficial uses and sustainable development under current conditions and in the future?
23	Where is additional research or policy needed to improve water management?
24	What is the groundwater overdraft in California's groundwater basins?
25	What is the current local, regional, and statewide surface water and groundwater quality?
26	What is the extent of agricultural drainage problems for current and future conditions?
27	How is water stored and moved in California's water management system?
28	What is the inter-relationship between water management and policies at the local, regional, statewide, and federal level?